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Quantitative Analysis of 39 Polybrominated Diphenyl Ethers by Isotope Dilution GC/ Low-Resolution MS

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A GC/low-resolution MS method for the quantitative isotope dilution analysis of 39 mono- to heptabrominated diphenyl ethers was developed. The effects of two different ionization sources, electron impact (EI) and electron capture negative ionization (ECNI), and the effects of their parameters on production of high-mass fragment ions [M - *x*H - *y*Br]- specific to PBDEs were investigated. Electron energy, emission current, source temperature, ECNI system pressure, and choice of ECNI reagent gases were optimized. Previously unidentified enhancement of PBDE high-mass fragment ion [M - *x*H - *y*Br]- abundance was achieved. Electron energy had the largest impact on PBDE high-mass fragment ion abundance for both the ECNI and EI sources. By monitoring high-mass fragment ions of PBDEs under optimized ECNI source conditions, quantitative isotope dilution analysis of 39 PBDEs was conducted using nine 13C12 labeled PBDEs on a low-resolution MS with low picogram to femtogram instrument detection limits.